Improvements relating to eddy current brakes

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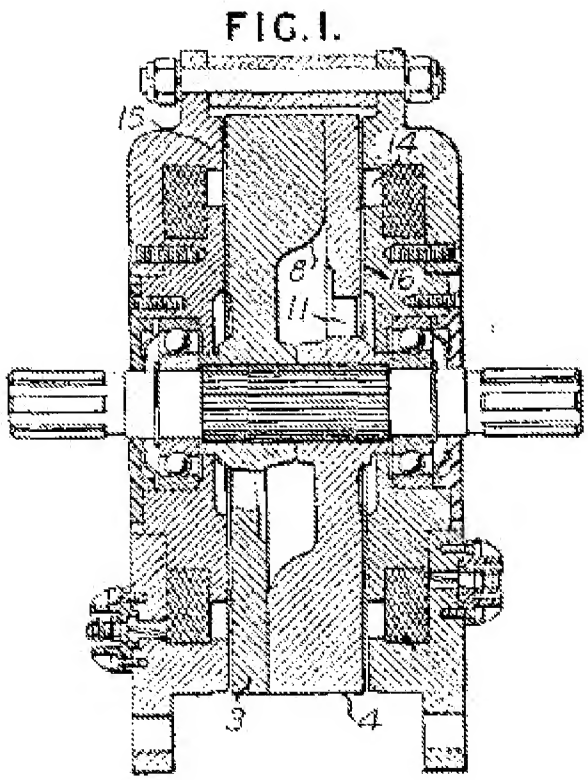
Abstract of **GB826048**

826,048. Electromagnetic brakes. BRITISH THOMSON-HOUSTON CO. Ltd. Nov. 20, 1957 [Dec. 7, 1956], No. 37504/56. Class 35. In an eddy-current brake wherein the rotor comprises two spaced discs with inner faces shaped to induce air currents between the discs, the stator has radial slots providing air passages and forming concentric sets of polepieces magnetized by a single coil and cooperating with the outer face of each rotor disc. As shown, an annular slot 14 separates the separate sets of stator polepieces 15, 16, and individual polepieces are separated by radial slots feeding air to the rotor inlets 11. The ribs 8 on the rotor discs 3, 4 interleave with one another.



PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: LEONARD GRIFFITHS

826,048

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Index at acceptance: —**Class 35,** A(1E2: 2E5).

International Classification: —**H02k.**

COMPLETE SPECIFICATION

Improvements relating to Eddy Current Brakes

We, THE BRITISH THOMSON-HOUSTON COMPANY, a British Company having its registered office at Crown House, Aldwych, London, W.C.2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to eddy current brakes of the kind in which a rotor affixed to a shaft to be braked is rotatable in a magnetic field which, on rotation of the rotor in the field, generates eddy currents in the rotor which provide a braking effect thereon.

The eddy currents produced, in a brake of the above kind during braking, generate heat in the rotor which has to be removed if satisfactory operation is to be achieved. It is known to construct the rotor of such a brake in the form of coaxial discs spaced along the shaft to be braked, the discs having over their opposed faces radial ribs which serve as fan blades to expel by centrifugal force air present between them, the air so displaced being replaced by air which has access to the space between the discs by way of holes located near hubs from which the discs extend. The replacing air enters from the outside of the brake through the spaces between individually energised electro-magnetic salient poles of alternate opposite polarity which are arranged on the stationary part of the brake in two sets directed towards the outer faces of the discs, the poles in each set being located with their axes lying on circles of equal radii concentric with the axis of the shaft.

In an eddy current brake of the kind above set forth and having a rotor constructed in the form of co-axial discs spaced along the shaft to be braked, the inner face of one or both of the discs being so shaped as, when rotating, to induce a circulation of air between the discs for cooling purposes, which air enters the space between the discs through apertures in the discs in the vicinity of the shaft, according to the invention, the stator which co-operates with the rotor is constituted by two magnetic field producing members located adjacent to the outer faces of the rotor discs, each member having concentric polar projections which, when magnetised by a single magnetising winding concentric therewith, are of opposite polarity and cause magnetic fluxes to enter and leave the adjacent rotor disc, said polar projections being provided with radial slots which provide salient poles and permit entry of cooling air into the space between the member and the adjacent rotor disc for passage to the space between the discs by way of said apertures.

The magnetic field producing members are thus of homopolar construction, the magnetising coil for each member being located in an annular space between the concentric poles which are of opposite polarity when magnetised by the passage of current through the coil. The radial slots provided in the magnetic field producing members are preferably arranged to extend on both sides of the annular slots containing the magnetising coil. By this means the induced current of cooling air flowing radially inwards through the slots also serves to prevent over-heating of the magnetising coil. The magnetic field producing members are fixedly mounted to enable the braking effect on the rotor to be produced and are provided at their inner periphery with suitable bearings to support the shaft with the rotor discs thereon.

A construction in accordance with the invention will now be described with reference to the accompanying drawing, in which:

Fig. 1 is a cross-section through the eddy current brake showing the shaft to be braked and the rotor mounted upon it, together with the magnetic field-producing members;

Fig. 2 is an end view of a portion of a rotor disc showing the shape thereof;

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Fig. 3 is an end view of the brake with a portion thereof broken away to show the magnetic field-producing member;

Referring to the drawings, the shaft to be braked is indicated at 1. It is provided with an enlarged intermediate portion splined at 2, on which the rotor discs 3, 4 are mounted. The rotor discs are of magnetic material, e.g. steel. The shaft is journalled in bearings 5, located within the inner periphery of the magnetic field producing members 6, 7. The rotor discs are provided on their inner faces with radial ribs 8, the ribs on the disc 3 being angularly inter-leaved with those on the disc 4. The rotor discs are provided with bosses 9 which engage with one another on their inner faces and provide the necessary separation between the rotor discs, the inner peripheries of the discs being of reduced thickness in order to provide a chamber 10 with which communicates apertures 11 provided for the circulation of cooling air. The magnetic field producing members 6, 7 are formed to provide an annular slot or recess 12 within which is located magnetising coil 13 for which suitable terminals 13^1 are provided. An annular slot 14 in the inner face of each of the magnetic field producing members is formed to produce concentric polar projections 15, 16 which, when the magnetising coil 13 is energised, are of opposite polarity and cause a magnetic flux to flow through the adjacent rotor disc. Each magnetic field producing member is conveniently formed in parts held together by bolts 16^1. This is indicated in order to enable the magnetising coil 13 to be positioned within the annular recess 12.

The inner faces of the members 6, 7 are provided, as shown in Fig. 3, with radial slots 17 which extend across the annular slot 14 to provide salient poles and to allow for the radially inward entry of a stream of cooling air, which stream is induced by the action of the ribs 8 provided on the inner opposing surfaces of the rotor discs when the rotor rotates the stream of cooling air flowing through the apertures 11 formed in the inner periphery of the rotor discs, as above mentioned. The passage of the cooling air induced from the surroundings of the brake flowing, as it does, across the annular slot 14, also serves to cool the magnetising coil 13. Members 6, 7 are held together by bolts 18 passing through ears 19 projecting from the periphery of the members 6, 7, while further ears 20 are furnished to enable the stationary portion of the brake to be secured to a suitable support.

It will be evident from the above description that the construction illustrated may be readily manufactured, the magnetic field producing members 6, 7 being mounted on a stationary portion of a vehicle, the shaft of which to be braked is connected with a shaft 1 in any suitable manner.

WHAT WE CLAIM IS:—

1. An eddy current brake of the kind set forth and having a rotor constructed in the form of coaxial discs spaced along the shaft to be braked, the inner faces of one or both of the discs being so shaped as, when rotating, to induce a circulation of air between the discs for cooling purposes, wherein the stator co-operating with the rotor is constituted by two magnetic-field-producing members located adjacent the outer faces of the rotor discs, each member having concentric polar projections which, when magnetised, by a single magnetising winding concentric therewith, are of opposite polarity and cause magnetic fluxes to enter and leave the adjacent rotor disc, the polar projections being provided with radial slots which provide salient poles and permit entry of cooling air into the space between the member and the adjacent rotor disc for passage to the space between the discs by way of said apertures.

2. An eddy current brake as claimed in Claim 1, in which the inner face of the rotor discs are formed with axially extending radially directed ribs, the ribs on one disc being inter-leaved with those on the other disc.

3. An eddy current brake as claimed in Claim 1 or 2, in which the radial slots in the magnetic-field-producing members extend on both sides of annular slots containing the magnetising coil.

4. An eddy current brake as claimed in Claim 1, 2 or 3, in which the magnetic-field-producing members are fixedly mounted and are each provided at its inner periphery with a bearing to support a shaft to which the rotor discs are secured.

5. An eddy current brake constructed substantially as described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements relating to Eddy Current Brakes

We, THE BRITISH THOMSON-HOUSTON COMPANY, a British Company having its registered office at Crown House, Aldwych, London, W.C.2, do hereby declare this invention to be described in the following statement:—

The present invention relates to eddy current brakes in which a rotor non-rotatably mounted on a shaft to be braked is rotatable in a magnetic field which, on rotation of the rotor in the field, generates eddy currents in the rotor which provides a braking effect thereon.

The object of the invention is to provide a construction of such a brake which may be readily manufactured and is so constructed as to provide adequate ventilation enabling the heat generated during a braking operation to be dissipated.

According to the invention, an eddy current brake has a rotor comprising two spaced coaxial discs, the inner faces of one or both of which are so shaped as, when rotating, to induce a circulation of air between the discs for cooling purposes, the stator being constituted by two magnetic field producing members located adjacent the outer faces of the rotor discs, each member having concentric poles which, when magnetised, are of opposite polarity and cause magnetic fluxes to enter and leave the adjacent rotor disc, whereby on rotation of the rotor discs to generate eddy currents therein, said members being provided with radial slots which provide salient poles and permit entry of cooling air into the space between the member and the adjacent rotor disc for passage to the space between the discs by way of apertures in the inner periphery of the rotor discs.

The magnetic field producing members are thus of homopolar construction, the magnetising coil for each member being located in an annular space between the concentric poles which are of opposite polarity when magnetised by the passage of current through the coil. The radial slots provided in the magnetic field producing members are preferably arranged to extend on both sides of the annular slots containing the magnetising coil. By this means the induced current of cooling air flowing radially inwards through the slots also serves to prevent over-heating of the magnetising coil. The magnetic field producing members are fixedly mounted to enable the braking effect on the rotor to be produced and are provided at their inner periphery with suitable bearings to support the shaft with the rotor discs thereon.

A construction in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a cross-section through one half of the eddy current brake showing the shaft to be braked and the rotor mounted upon it, together with the magnetic field-producing members;

Fig. 2 is a plan view of a section of the periphery of the brake;

Fig. 3 is an end view of a portion of a rotor disc to show the shape thereof;

Fig. 4 is a plan view of a rotor disc, and

Fig. 5 is an end view of a portion of the magnetic field-producing member looking towards the inner face thereof.

Referring to the drawings, the shaft to be braked is indicated at 1. It is provided with an enlarged intermediate portion at 2, on which the rotor discs 3, 4 are mounted. The shaft is journalled in bearings 5, located within the inner periphery of the magnetic field producing members 6, 7. The rotor discs are provided on their inner faces with radial ribs 8, the ribs on the disc 3 being angularly inter-leaved with those on the disc 4. The rotor discs are provided with bosses 9 which engage with one another in their inner faces and provide the necessary separation between the rotor discs, the inner peripheries of the discs being of reduced thickness in order to provide a chamber 10 with which communicates apertures 11 provided for the circulation of cooling air. The magnetic field producing members 6, 7 are formed to provide an annular slot or recess 12 within which is located magnetising coil 14 for which suitable terminals, not shown, are provided. An annular slot 14 in the inner face of each of the magnetic field producing members is formed to produce concentric poles 15, 16 which, when the magnetising coil 13 is energised, are of opposite polarity and cause a magnetic flux to flow through the adjacent rotor disc. Each magnetic field producing member is conveniently formed in two parts. This is indicated in order to enable the magnetising coil 14 to be positioned within the annular recess 12.

The inner faces of the members 6, 7 are provided, as shown in Fig. 4, with radial slots 17 which extend across the annular slot 14 to provide for the radially inward entry of a stream of cooling air, which stream is induced by the action of the ribs 8 provided on the inner opposing surfaces of the rotor discs when the rotor rotates the stream of cooling air flowing through the apertures 11 formed in the inner periphery of the rotor discs, as above mentioned. The passage of the cooling air induced from the surroundings of the brake flowing, as it does, across the annular slot 14, also serves to cool the magnetising coil 13, It will be evident from the above description that the construction illustrated may be readily manufactured, the magnetic field producing members 6, 7 being mounted on a stationary portion of a vehicle, the shaft of which to be braked is connected with the shaft 1 in any suitable manner.

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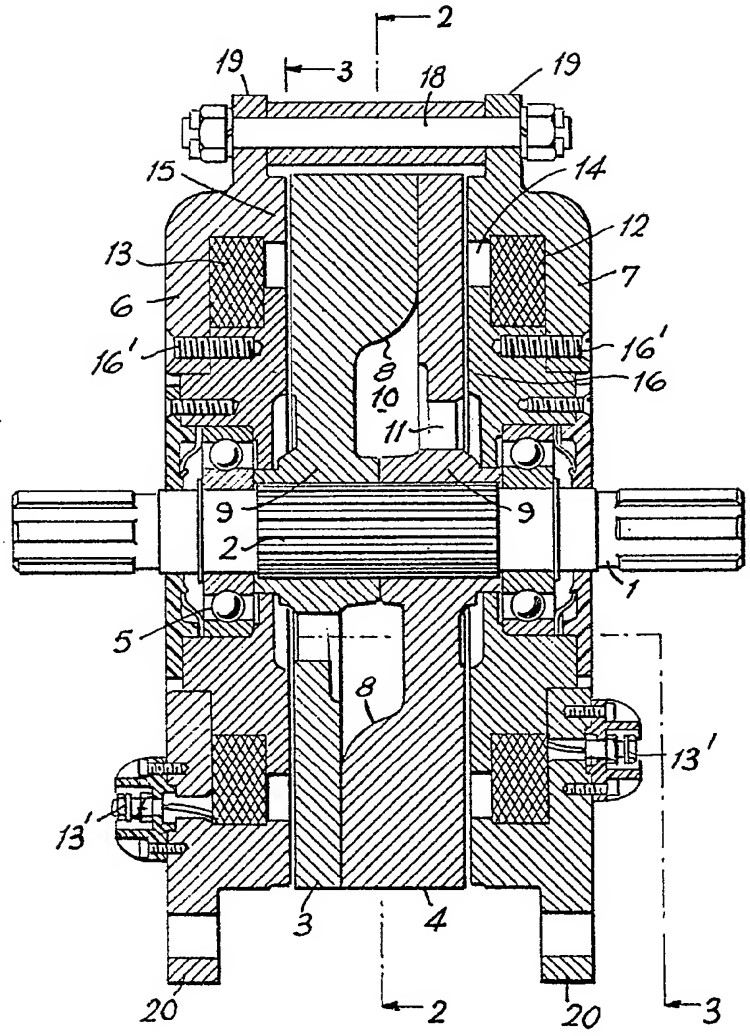
Fig. 1.



826,048 COMPLETE SPECIFICATION

2 SHEETS

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SHEETS 1 & 2

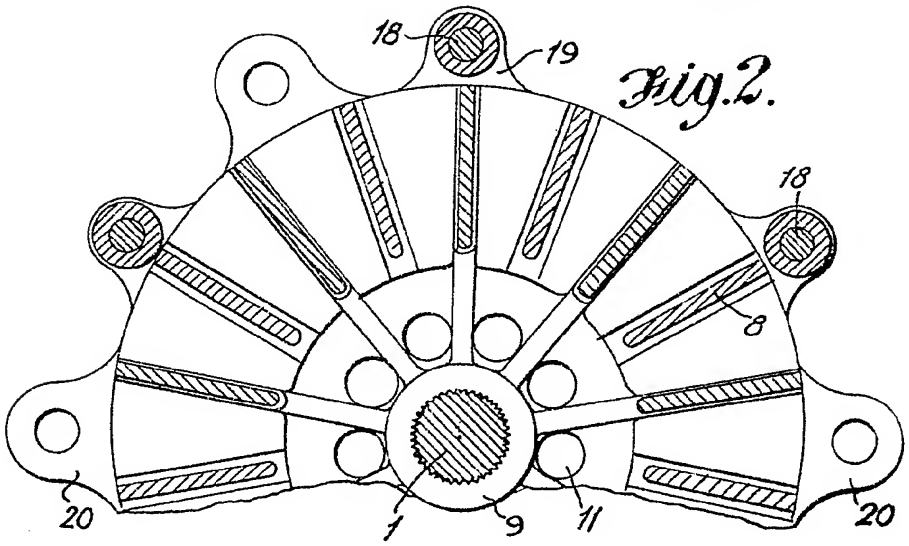

Fig.2.

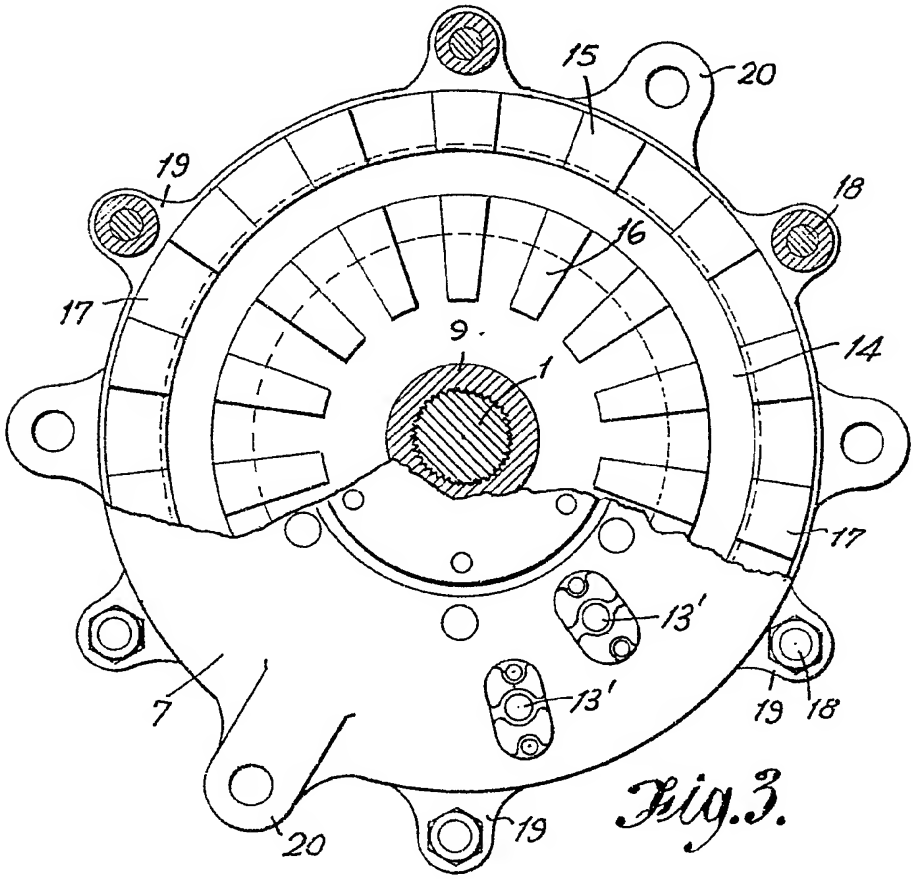

Fig.3.

826,048 COMPLETE SPECIFICATION

2 SHEETS

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SHEETS 1 & 2

Fig.1.

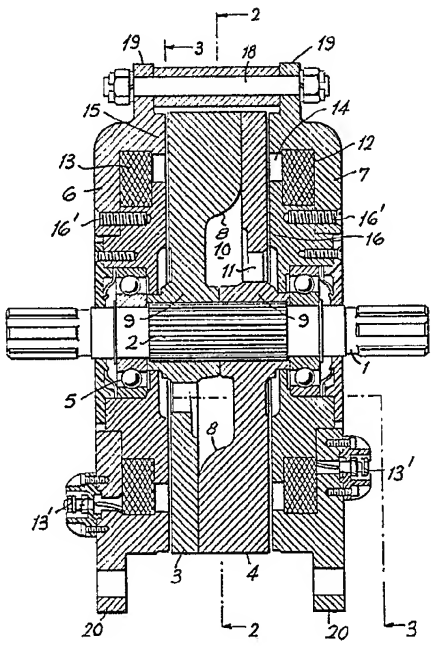
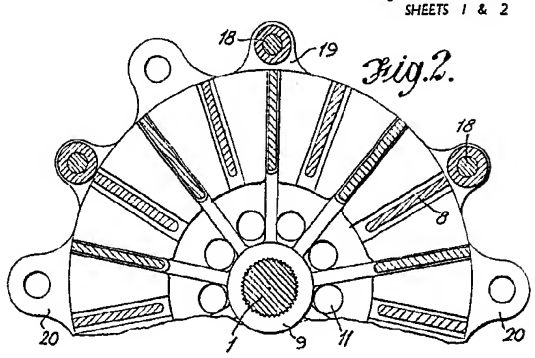


Fig.2.



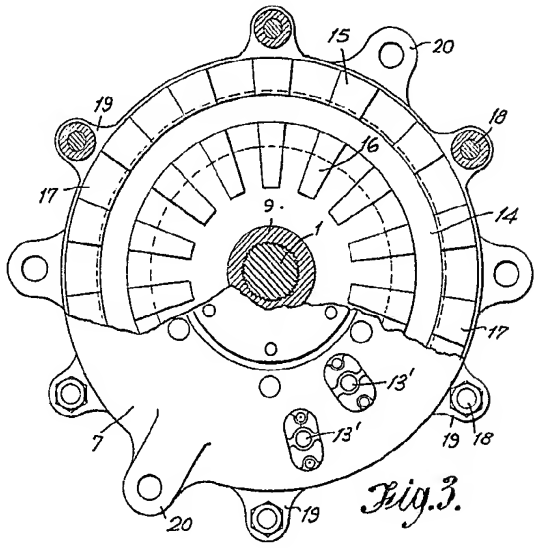


Fig.3.

Fig. 1.

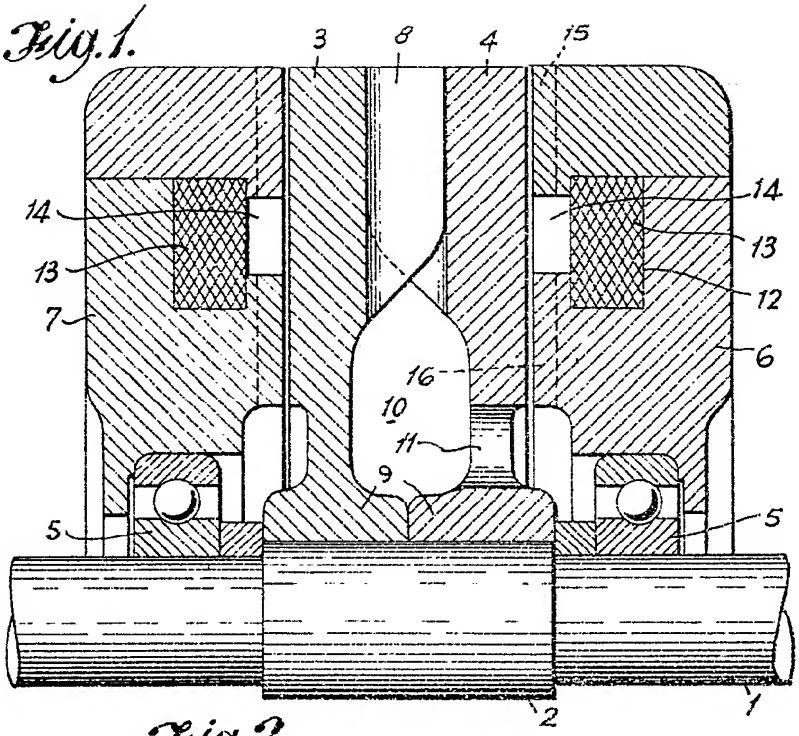
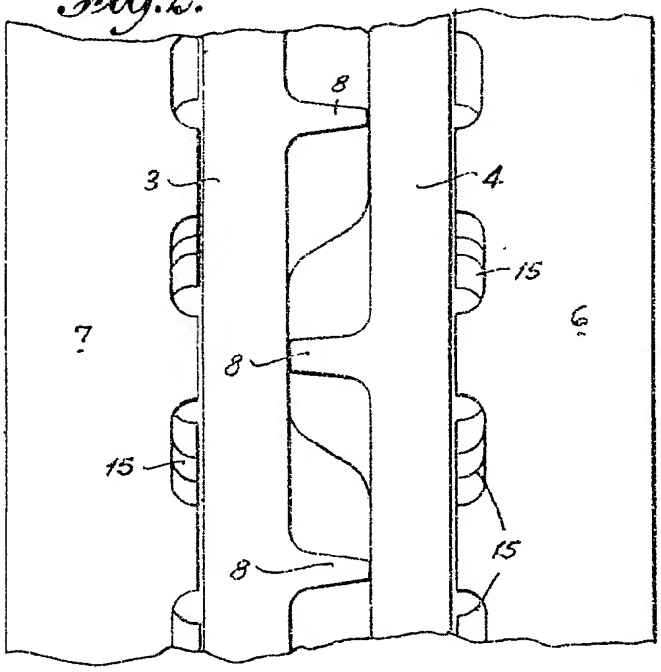


Fig. 2.



826,048 PROVISIONAL SPECIFICATION

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SHEETS 1 & 2

Fig. 3.

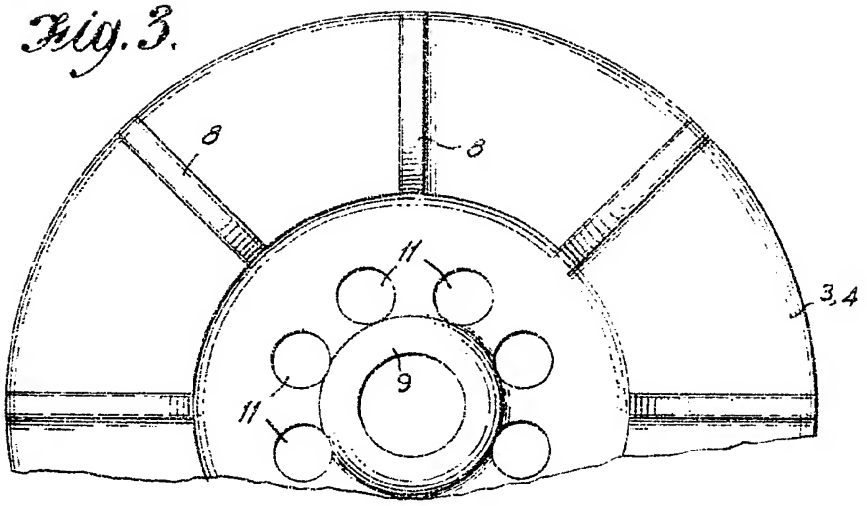


Fig. 4.

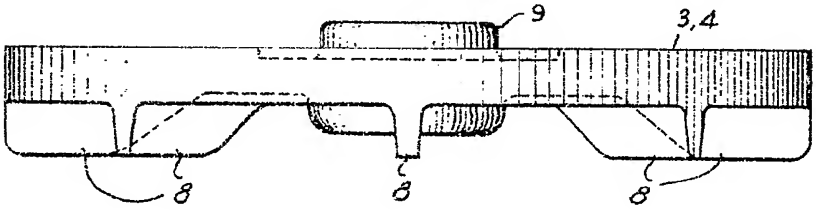
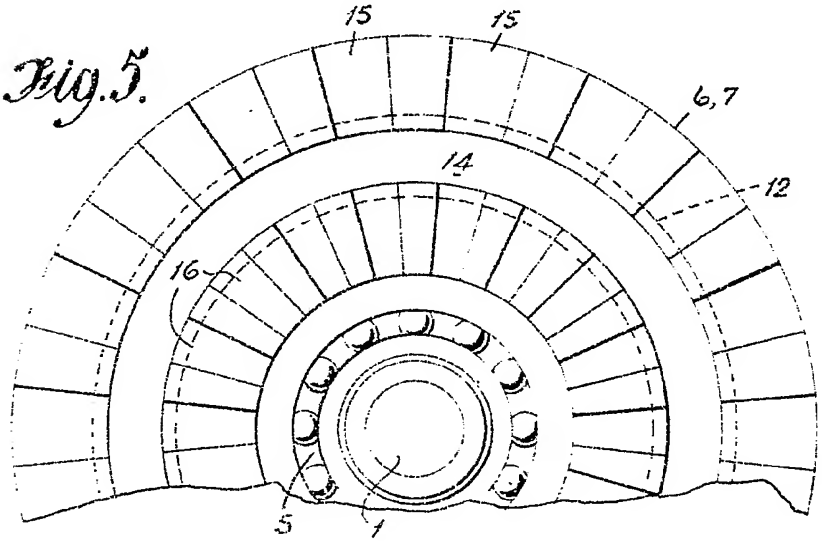


Fig. 5.



826,048 PROVISIONAL SPECIFICATION

2 SHEETS This drawing is a reproduction of the Original on a reduced scale. SHEETS 1 & 2

Fig. 1.

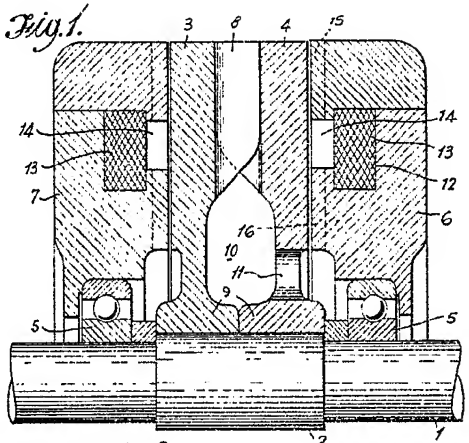


Fig. 2.

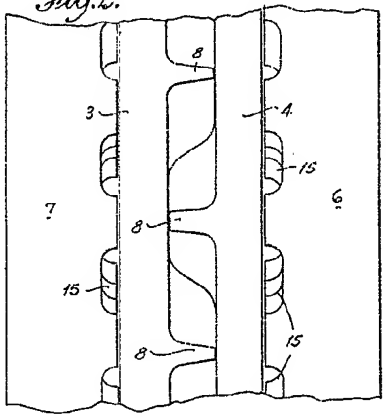


Fig. 3.

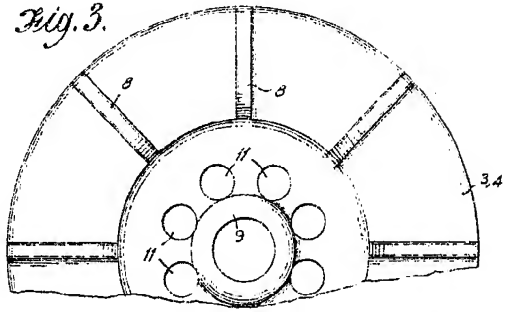


Fig. 4.

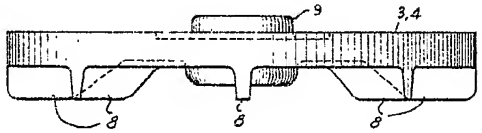


Fig. 5.